Statement of Purpose

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Affordable and reliable Internet access has been a problem that persists in the developing nations. Growing up in one of the developing countries, Indonesia, I have experienced the impact of this problem first hand. For instance, thousands of deaths resulted from the Tsunami that struck one of the islands of Indonesia back in 2004. Had there been a properly established networking infrastructure, an early warning system could be designed and thus, this incident could be eluded. One question to ponder in this case is how to design a more energy-efficient or more reliable network protocol that match the economic capabilities of developing nations. Refining my understanding in the area of computer systems to be able to ameliorate the quality of life in the developing nations is exactly the reason why I am applying for a PhD program in Stanford.

I have been conducting research with Professor John Kubiatowicz and the Par Lab operating systems group for the past two years. Specifically, I help design and implement Tessellation, our manycore OS. Experiencing a large-scale systems project, from the early conceptual design stages through implementation and evaluation, has been extremely fruitful, my experiences with the Par Lab have helped in refining my research interests while preparing me for future systems research.

My work in Tessellation began with designing and implementing its Quality of Service (QoS) guarantees in Linux. We needed to implement our own lock-free shared-memory buffer for efficient communications between processes. The framework used for composing the GUI applications that we were targeting is Qt and thus, we modified its internals to encompass the same model as Tessellation. In the end, we were able to earn a 7x speedup in our version of Qt compared to the unmodified Qt. The drastic increase in performance that we achieved is enthralling since we managed to exercise our engineering skills in a commercial program used by thousands of people. Moreover, the interest expressed by companies such as Nokia when our work is presented at the ParLab 2010 winter retreat [1] has further confirmed our success.

Following that, I was working to complete the existing work in porting Advanced Configuration and Power Interface (ACPI) to Tessellation, collaborating with a post-doctoral researcher from NEC. Understanding the Intel manuals is a challenge in itself since since there are hardly any tutorials online. However, by the end of the summer, I'm able to navigate my way through the manuals and even managed to get ACPI running smoothly in Tessellation. When I was porting ACPI, I also restructured how PCI devices are being discovered and added support for PCI-express devices in Tessellation. As our paper deadline is approaching, my focus shifted to implementing and automating the process of running the experiments followed by parsing the results and constructing the graph. My contribution to the project has resulted in a poster presented at HotChips 2011 [3] and two publications submitted to EuroSys and CATA 2012 [2, 4] which are currently in-review.

Additionally, I believe that teaching is an integral part of conducting research. A discovery is far from complete if one does not also find a way to present and elucidate it to others. Even more importantly, organizing a vast array of result for presentation is a crucial skill that a researcher must share with a teacher, since without it, the researcher cannot gain a clear sense of direction of his work.

My early experience with students came as a tutor in multiple subjects such as mathematics and computer science when I was in high school and community college. Here at UC Berkeley, I have served in the HKN EECS honor society committee to hold tutoring hours for EECS undergraduates. However, my most significant and enjoyable teaching experience was as a teaching assistant for an upper-division operating system class taught by Professor John Kubiatowicz. I lead the discussion sessions and graded the projects and exams. Yet, the interesting aspect of it is during which I was holding design reviews for the projects since there are big project components to the course. It's fascinating to observe how different students perceive the projects from different angles. Having to lead them to solve the projects without telling them exactly how to do it is a challenging, but intellectually rewarding task.

Stanford University stands out due to the number of world-renowned faculties in the area of systems that I would like to work with such as Professor John Ousterhout and Professor Mendel Rosenblum. I am also attracted by the strength of the undergraduate program in Stanford as I look forward to teaching as a graduate student. For these reasons, I believe that the PhD program at Stanford is the best match for my interest. My long term goal is to remain in the academia as a professor, contributing to the research community, undergraduate education and most importantly, the society as a whole. Given my background, I believe that I am in a good position to make crucial contribution in such pursuits.

References

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